

IEC RESEARCH STATUS AT MSFC

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MSFC // TD40

EXPERIMENT SET-UP

★ Hardware Characteristics

- ❖ 2-foot Spherical Vacuum Chamber
- ❖ 5-kW High Voltage Power Supply by

Hipotronics

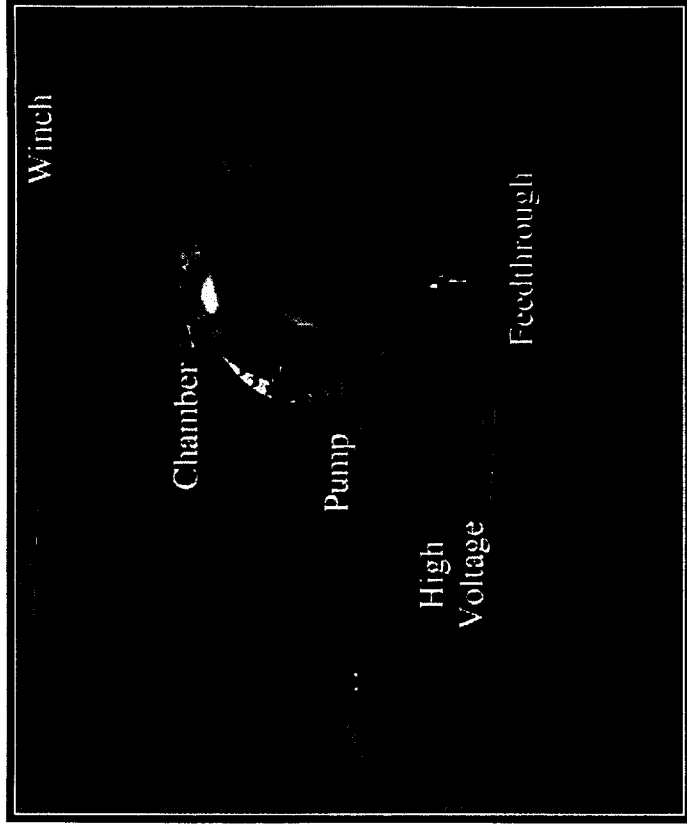
- 100 kV
- 50 mA

❖ Diagnostics

- Neutron Detector (Ag Counter)
- Proton Detector (PD PIPS)
- Photon Emission Spectroscopy
- Laser Techniques under consideration

❖ Propellant Feed System based on Thermal Conductivity Mass Flow Control

- Hydrogen, Deuterium
- Mass Flow Control Calibration




★ Planned Pulsed Mode Operation

- ❖ Pulse Width = 0.1 msec
- ❖ Peak Voltage = 100 kV
- ❖ Peak Current = 50 A
- ❖ Pulse Energy = 200 J

GRID MANUFACTURING



★ Issues

- ❖ Reproducibility (test data on designs)
 - ❖ Sphericity
 - ❖ Uniformity
-  Radial Potentials

★ Identified Manufacturing Techniques

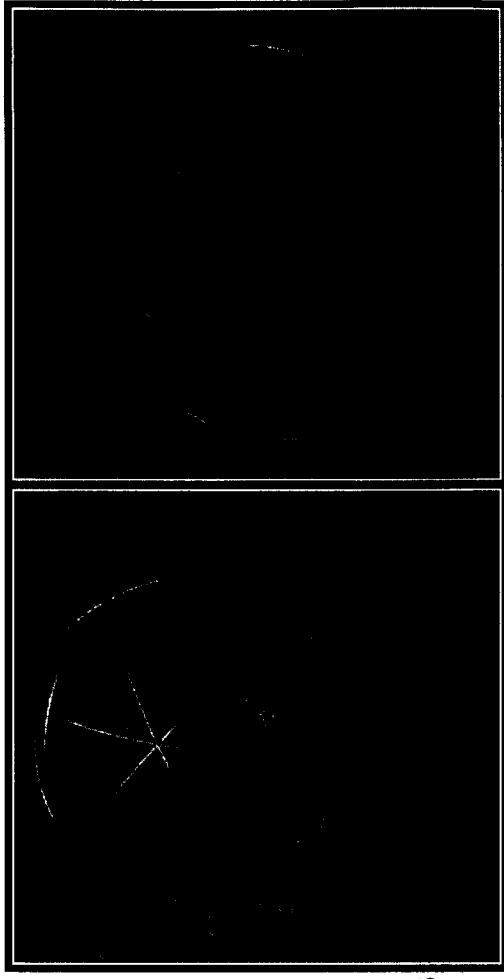
- ❖ Metal Deposition Techniques
 - ⦿ Electro-Chemical Ni Plating: Easy Production of Templates with Stereolithography
 - ⦿ Wire Arc- and HVOF Flame- Sprays: SS Plating on Al Template, Al Plating on Stereolithographical Epoxy Template
 - ⦿ Hollow Grid Fabrication (Cooling Channels) for High Power Applications
- ❖ Negative Template Mold
 - ⦿ Stereolithography used in Fast-Prototyping Technology
 - ⦿ Metal O-rings provide Pre-fabricated Loops
 - ⦿ Spot Welding of SS
- ❖ Machining
 - ⦿ Electrostatic-Discharge Machining (EDM) & Stamping (or 3-D)
 - ⦿ Laser Cutting (tentative)

GRID FOR IEC OPERATION



★ Negative Template Technique

- ❖ Template is made with Stereolithography Technique
- ❖ Template provides
 - grooves for arranging SS loops into proper position and
 - holes for spot welding the loops together.



★ Electro-Chemical Technique

- ❖ Template is made with Stereolithography Technique.
- ❖ Template is coated with conductive paint.
- ❖ Template is submerged in a Nickel-Sulfamate bath.
- ❖ Nickel coating is ≈ 0.13 mm thick at 7 hours (in example shown)

